



OTX2 gene

orthodenticle homeobox 2

Normal Function

The *OTX2* gene provides instructions for producing a protein that regulates the activity of other genes. On the basis of this action, the *OTX2* protein is called a transcription factor. The *OTX2* gene is part of a family of homeobox genes, which act during early embryonic development to control the formation of many body structures.

The *OTX2* gene plays a critical role in the development of the eyes and related structures, such as the nerves that carry visual information from the eyes to the brain (optic nerves). It is also involved in brain development, including the formation of the pituitary gland at the base of the brain. The pituitary gland produces hormones that help control growth, reproduction, and other critical body functions.

Health Conditions Related to Genetic Changes

[coloboma](#)

[combined pituitary hormone deficiency](#)

[microphthalmia](#)

[septo-optic dysplasia](#)

At least eight mutations in the *OTX2* gene have been identified in people with the major features of septo-optic dysplasia. Some of these mutations prevent the production of a functional *OTX2* protein. Other mutations lead to a defective version of the protein that cannot regulate the activity of other genes.

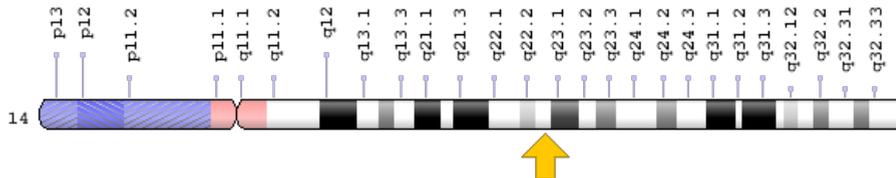
A shortage of the *OTX2* protein disrupts the formation and early development of the eyes, the optic nerves, the pituitary gland, and other brain structures. These problems with development lead to the major features of septo-optic dysplasia, including eye abnormalities, underdevelopment of the pituitary gland (pituitary hypoplasia), and learning difficulties. However, the signs and symptoms associated with *OTX2* gene mutations vary widely, even among affected members of the same family. Additional features that have been reported in people with *OTX2* gene mutations include delayed development, slow growth, and seizures.

Studies suggest that mutations in the *OTX2* gene are a rare cause of septo-optic dysplasia.

Chromosomal Location

Cytogenetic Location: 14q22.3, which is the long (q) arm of chromosome 14 at position 22.3

Molecular Location: base pairs 56,800,707 to 56,810,476 on chromosome 14 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- homeobox protein OTX2
- MCOPS5
- MGC45000
- orthodenticle homolog 2
- OTX2_HUMAN

Additional Information & Resources

Educational Resources

- Endocrinology: An Integrated Approach (first edition, 2001): The Pituitary Gland
<https://www.ncbi.nlm.nih.gov/books/NBK27/>

GeneReviews

- Microphthalmia/Anophthalmia/Coloboma Spectrum
<https://www.ncbi.nlm.nih.gov/books/NBK1378>

Scientific Articles on PubMed

- PubMed
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28OTX2%5BTIAB%5D%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D>

OMIM

- ORTHODENTICLE, DROSOPHILA, HOMOLOG OF, 2
<http://omim.org/entry/600037>

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
<http://atlasgeneticsoncology.org/Genes/OTX2ID46429ch14q22.html>
- ClinVar
<https://www.ncbi.nlm.nih.gov/clinvar?term=OTX2%5Bgene%5D>
- HGNC Gene Family: PRD class homeoboxes and pseudogenes
<http://www.genenames.org/cgi-bin/genefamilies/set/521>
- HGNC Gene Symbol Report
http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=8522
- NCBI Gene
<https://www.ncbi.nlm.nih.gov/gene/5015>
- UniProt
<http://www.uniprot.org/uniprot/P32243>

Sources for This Summary

- Dateki S, Fukami M, Sato N, Muroya K, Adachi M, Ogata T. OTX2 mutation in a patient with anophthalmia, short stature, and partial growth hormone deficiency: functional studies using the IRBP, HESX1, and POU1F1 promoters. *J Clin Endocrinol Metab.* 2008 Oct;93(10):3697-702. doi: 10.1210/jc.2008-0720. Epub 2008 Jul 15.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/18628516>
- Dateki S, Kosaka K, Hasegawa K, Tanaka H, Azuma N, Yokoya S, Muroya K, Adachi M, Tajima T, Motomura K, Kinoshita E, Moriuchi H, Sato N, Fukami M, Ogata T. Heterozygous orthodenticle homeobox 2 mutations are associated with variable pituitary phenotype. *J Clin Endocrinol Metab.* 2010 Feb;95(2):756-64. doi: 10.1210/jc.2009-1334. Epub 2009 Dec 4.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/19965921>
- Diaczok D, Romero C, Zunich J, Marshall I, Radovick S. A novel dominant negative mutation of OTX2 associated with combined pituitary hormone deficiency. *J Clin Endocrinol Metab.* 2008 Nov; 93(11):4351-9. doi: 10.1210/jc.2008-1189. Epub 2008 Aug 26.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/18728160>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2582563/>
- Ragge NK, Brown AG, Poloschek CM, Lorenz B, Henderson RA, Clarke MP, Russell-Eggitt I, Fielder A, Gerrelli D, Martinez-Barbera JP, Ruddle P, Hurst J, Collin JR, Salt A, Cooper ST, Thompson PJ, Sisodiya SM, Williamson KA, Fitzpatrick DR, van Heyningen V, Hanson IM. Heterozygous mutations of OTX2 cause severe ocular malformations. *Am J Hum Genet.* 2005 Jun; 76(6):1008-22. Epub 2005 Apr 21. Erratum in: *Am J Hum Genet.* 2005 Aug;77(2):334.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/15846561>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1196439/>

- Tajima T, Ohtake A, Hoshino M, Amemiya S, Sasaki N, Ishizu K, Fujieda K. OTX2 loss of function mutation causes anophthalmia and combined pituitary hormone deficiency with a small anterior and ectopic posterior pituitary. *J Clin Endocrinol Metab.* 2009 Jan;94(1):314-9. doi: 10.1210/jc.2008-1219. Epub 2008 Oct 14.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/18854396>
 - Wyatt A, Bakrania P, Bunyan DJ, Osborne RJ, Crolla JA, Salt A, Ayuso C, Newbury-Ecob R, Abou-Rayyah Y, Collin JR, Robinson D, Ragge N. Novel heterozygous OTX2 mutations and whole gene deletions in anophthalmia, microphthalmia and coloboma. *Hum Mutat.* 2008 Nov;29(11):E278-83. doi: 10.1002/humu.20869.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/18781617>
-

Reprinted from Genetics Home Reference:
<https://ghr.nlm.nih.gov/gene/OTX2>

Reviewed: March 2010

Published: March 21, 2017

Lister Hill National Center for Biomedical Communications
U.S. National Library of Medicine
National Institutes of Health
Department of Health & Human Services